opening the first valve to introduce the xenon gas contained in the ultraviolet laser gas supply piping to the chamber, and

opening the second valve and introducing the gas for ultraviolet laser from the ultraviolet the gas cylinder into the chamber thereby combining the xenon gas previously introduced into the chamber with the gas for ultraviolet laser. --

REMARKS

In the foregoing amendments, the abstract of the disclosure was amended to contain no more than 150 words. Accordingly, applicant respectfully requested that the examiner reconsider and withdraw the objection to the abstract of the disclosure set forth at about the middle of page 2 of the Official Action.

The Official Action objected to the disclosure and requested the information cited within the specification to ensure proper understanding of the disclosure. Applicant is attaching hereto an appropriate Information Disclosure Statement (IDS) containing the information requested in the outstanding Office Action. Therefore, applicant respectfully requests that the examiner reconsider and withdraw the objection to the disclosure set forth in the outstanding Office Action.

Laid-Open Publication No. 11-23709" was mistranslation for "Japanese Patent Application No. 11-23709." An appropriate correction to applicant's specification was included in the foregoing amendments. It is further respectfully noted that the "Japanese Patent Application No. 11-23709" was deemed withdrawn by a legal fiction, because a new patent application (Application No. 11-272496) was filed claiming the internal priority based on the Japanese Patent Application No. 11-23709. The new Patent Application No. 11-272496 was laid-open as the Japanese Patent Application Laid-Open Publication No. 2000-294856, which contains all of the contents of the Japanese Patent Application No. 11-23709. Therefore, applicant included a copy of the Japanese Patent Application Laid-Open Publication No. 2000-294856, instead of a copy of the Japanese Patent Application Laid-Open Publication No. 11-23709, in the IDS filed together herewith.

Attached hereto is a marked-up version of the changes made to the specification and abstract of the disclosure. The attached pages are entitled: **"VERSION WITH MARKINGS TO SHOW CHANGES MADE."**

In the foregoing amendments, claims 1-7 were canceled from the application and replacement new claims 8-14. New claims 8, 10 and 11 are based on claims 1-3 and 7; new claim 12 is based on claims 4 and 5; and new claims 13 and 14 are based on claim 6. In claim 9 defines that the excimer laser oscillates a narrow-ban laser light having an output including pulse frequencies higher than about 1 kHz, such as shown in

Fig. 2 of the present application. Accordingly, claims 8-14 are in the application for consideration by the examiner.

Claims 4-6 were rejected under 35 U.S.C. § 112, second paragraph, as being vague and indefinite for failing to particularly point out and distinctly claim the subject matter applicant regards as the invention. These claims were canceled in the foregoing amendments, and claims 8-14 were added to the application. Applicant respectfully submits that new claims 8-14 particularly point out and distinctly claim the subject matter regarded as the invention within meaning of 35 U.S.C. § 112, second paragraph. Therefore, applicant respectfully requests that the Examiner reconsider and withdraw this rejection.

Beginning at the about the middle of page 3 and continuing through the top of page 5, the Official Action set forth two prior art rejections of the claim. The first is a rejection of Claims 1-3 and 7 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,014,398 of Hofmann *et al.* (Hofmann) in view of U.S. Patent No. 5,090,020 of Bedwell. The second is a rejection of Claims 4-6 under 35 U.S.C. § 103(a) as being unpatentable over Hofmann in view of Applicant's Admitted Prior Art.

In the second rejection, the Official Action basically took the position that it is well known that the connecting gas cylinders together external to a gas receiving apparatus, such as a manifold or eximer laser chamber, minimizes the service requirements related to the gas laser

replacement and decreases the time required for these replacements. Applicant respectfully submits that some authority or teaching should be cited to support this position before this position can be used to reject applicant's claims.

In the rejection over Hofmann and Bedwell, the Official Action stated that it is well known in the art that He is an appropriate buffer gas for ArF eximer lasers, apparently as shown by Bedwell. The Official Action concluded that it would have been obvious to use He as a buffer gas in Hofmann.

An important aspect of new claim 8 is that the buffer gas mainly contains He, and Xe is added to the laser gas. Hofmann proposes that Xe is added to the laser gas of the ArF excimer laser. However, Hofmann does not describe that the buffer gas of this ArF excimer laser mainly contains He. Bedwell proposes that buffer gas of the ArF excimer laser mainly contains He and Xe is contained in the rare gas. However, Bedwell does not suggest that Xe is added to the laser gas.

In summary, neither Hofmann nor Bedwell describe nor suggest the configuration of present claim 8 that the main component of the buffer gas is He, and Xe is added to the laser gas. As described in applicant's specification specification, page 19, lines 7-16, the presently claimed invention, as set forth in claim 8, provides an advantageous effects including the fact that the laser device can be small-sized and outputs are stabilized, etc.

The importance and significance of using He in place of neon, such as proposed in Hofmann, is illustrated in Fig. 2 of the present application. This diagram shows that at above a pulse frequency of 1 kHz an unexpected advantage is achieved by the use of He as opposed to Ne. Claim 9 defines that the laser device outputs laser light concludes pulse frequencies higher than about 1 kHz.

Applicant's claim 10 defines, *inter alia*, a scanning type exposure device which performs exposure of an entire semiconductor chip on a wafer by moving the wafer while the radiating a pulse laser light to each of a plurality of the radiation regions smaller than an area of the semiconductor chip, wherein an ArF excimer laser gas with a buffer gas mainly containing He is used as a light source for the laser light. In the scanning type exposure device, in order to control the irregularity of exposure due to dispersion of pulse outputs of the ArF excimer laser, it is necessary to keep the pulse outputs within a predetermined range and irradiate more than a predetermined number of laser pulses for each irradiation region. For this reason, it is necessary to increase a pulse frequency of the ArF excimer laser.

The main component of the buffer gas in the ArF excimer laser disclosed in Hofmann is not He, as presently claimed. When the pulse frequency is increased by this kind of ArF excimer laser, outputs are degraded. Therefore, it is impossible to improve the exposure ability of

the scanning type exposure device in a device such as proposed by Hofmann.

On the other hand, according to applicant's claim 10, as described in the specification, page 15, lines 4-13, a high-frequency ArF excimer laser can be realized without degrading the pulse output and, as described in the specification, page 18, lines 5-12, an improved scanning ability of the scanning type exposure device can be achieved. The teachings of Hofmann and Bedwell do not contemplate or suggest the use a laser gas with a buffer gas mainly of He, therefore cannot contemplate or suggest the advantages achieved thereby.

In the device defined in claim 11, the same advantageous effect as by the device defined in claim 10 can be achieved. In addition, an advantageous effect is achieved in that the ArF excimer laser is small-sized and outputs are stabilized, etc.

The piping configurations in the new claims 12-14 are effective for supply of a trace quantity (e.g., 1 ppm) of Xe gas into the chamber. Claim 13 concretely defines the supply and exhaustion of the gas for ultraviolet laser and Xe gas of the claim 12. Claim 13 defines a controller that opens and closes the valves in a specific manner. Since this claim requires a controller to perform specific functions, the opening and closing of the various valves defined therein must be shown in the prior art structure before the claim can be obvious. This structure is not contemplated or suggested by the teachings of Hofmann and Bedwell.

The piping configurations of the claims 12-14 is explained below with reference to Fig. 9.

In the presently claimed invention, a trace quantity (i.e., 1 ppm) of Xe gas is supplied into the chamber 70. Therefore, the quantity measurement of a trace quantity of Xe gas is carried out and Xe gas is supplied into the chamber in the following manner. First of all, when the valves 74 and 75 (first and second valves) are closed and the valve 76 (third valve) is opened, Xe gas is supplied from the Xe gas cylinder 82 into the mixture piping divided by the valves 74, 75 and 76. Since the volume of the interior of the piping is made small normally, the volume of the mixture piping becomes extremely small. Therefore, when Xe gas is supplied into the mixture piping while the valves 74 and 75 are closed, because unnecessary quantity of Xe gas is not supplied into the mixture piping, the quantity measurement of Xe gas of a trace quantity volume by the pressure gauge 17 can be carried out easily.

It is also possible to carry out the quantity measurement of Xe gas by directly connecting the gas cylinder 82 and the chamber 70 with the piping. In this case, however, a supply port is provided for the Xe gas cylinder in the chamber 70. This is preferable to modifying the existing chamber 70. According to the piping configuration of the 12 and 14, it is possible to supply a trace quantity of Xe gas by modifying the existing piping, not by modifying the existing chamber 70.

For the reasons set forth above, applicant respectfully submits that the presently claimed invention is distinguishable from the teachings of a Hofmann and Bedwell within the meaning of 35 U.S.C. § 103. Therefore, applicant respectfully requests that the Examiner reconsider and withdraw all the prior art rejections against applicant's claims as set forth in the outstanding Office Action.

Based on the foregoing, applicant respectfully requests favorable consideration and a formal allowance of claims 8-14. While it is believed that the present response places the application in condition for allowance, should the Examiner have any comments or questions, it is respectfully requested that the undersigned be telephoned at the below listed number to resolve any outstanding issues.

In the event this paper is not timely filed, applicant hereby petitions for an appropriate extension of time. The fee therefor, as well as any other fees which may become due, may be charged to our Deposit Account No. 22-0256.

Respectfully submitted,
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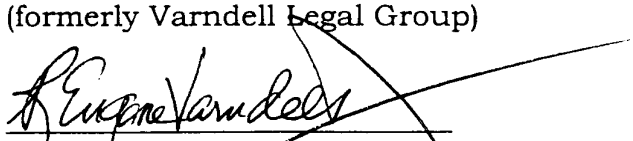
(formerly Varndell Legal Group)



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning at page 5, line 12, was amended as follows:

-- Therefore, the applicant for the present invention has proposed a technique to improve variations in the amount of light exposure due to the burst characteristic and the spike characteristic by adding a trace quantity of xenon gas to the gas for ultraviolet laser in the chamber in Japanese Patent Application [Laid-Open Publication] No. 11-23709. --

IN THE ABSTRACT OF THE DISCLOSURE:

The abstract of the disclosure was amended as follows:

-- A buffer gas contained in a laser gas used for an ArF excimer laser mainly consists of He, and Xe is preferably added to the laser gas. [Thus, the ArF excimer laser which can have its pulse frequency raised without upsizing the device can be provided. And, this ArF excimer laser is used for a scanning type exposure device.] Mixture piping divided by valves is disposed on piping running from a chamber to an excimer laser gas cylinder, the mixture piping and a Xe gas cylinder are connected, gas exhaust by a gas exhaust module and opening and closing of the valves are controlled by a gas controller to add a trace quantity of xenon gas to the excimer laser gas. Thus, to remedy a burst characteristic and a spike characteristic of the ultraviolet laser device by adding a trace quantity of

xenon gas, the xenon gas can be supplied efficiently into the chamber without modifying existing laser gas supply equipment. --